CLAIMS

1. A lithographic apparatus comprising:

an illumination system for providing a projection beam of radiation;

a support structure for supporting a patterning structure, the patterning structure serving to impart a pattern to the projection beam to form a patterned beam;

a substrate table for holding a substrate;

a projection system for projecting the patterned beam onto a target portion of the substrate;

wherein the patterning structure comprises an aluminium absorber layer with a protective top coating and wherein the patterning structure improves imaging by eliminating or at least minimising the formation of aberrations in the patterned beam.

2. A lithographic apparatus according to claim 1, wherein the aluminium forms a substantially flat absorber surface.

3. A lithographic apparatus according to claim 1, wherein the aluminium has a thickness which is substantially constant.

4. A lithographic apparatus according to claim 1, wherein the aluminium has a thickness of about 50 nm to about 200 nm.

5. A lithographic apparatus according to claim 1, wherein the aluminium has a thickness of about 70 nm.

6. A lithographic apparatus according to claim 1, wherein the aluminium has a protective top coating of any of aluminium oxide, aluminium nitride, chromium oxide, ruthenium, niobium or any combination thereof.

7. A lithographic apparatus according to claim 6, wherein the protective top coating has a thickness of about 0.1 nm to about 5 nm.

8. A lithographic apparatus according to claim 6, wherein the protective top coating has a thickness of about 1 nm.

9. A lithographic apparatus according to claim 1, wherein the patterning structure comprises a bottom substrate material with a low coefficient of thermal expansion (CTE).

10. A lithographic apparatus according to claim 1, wherein beneath the aluminium absorber layer there is a series of alternating layers of high index refraction material and low index refraction material.

11. A lithographic apparatus according to claim 10, wherein there are about 20 to about 80 layers of high and low index refraction material.

12. A lithographic apparatus according to claim 10, wherein combinations of high and low index refraction material are as follows: Mo/Si; Ru/Si; Ru-Mo/Si; Rh/Si; Pd/Si; Pt/Si; Mo/Y; Ru-Mo/Y; or Mo alloys and Si alloys.

13. A lithographic apparatus according to claim 10, wherein the high and low index refraction material have a thickness of about 1 nm to about 10 nm.

14. A lithographic apparatus according to claim 10, wherein between the high and low index refraction material there is a barrier layer.

15. A lithographic apparatus according to claim 1, wherein the patterning structure further comprises a buffer layer.

16. A lithographic apparatus according to claim 15, wherein the buffer layer is silicon dioxide.

17. A lithographic apparatus according to claim 1, wherein the projection system comprises means for reflecting or refracting the projection beam.

18. A lithographic apparatus according to claim 1, wherein the radiation is Extreme Ultra-Violet radiation (EUV).

19. A lithographic apparatus according to claim 1, wherein the radiation has a wavelength of between about 5 nm and about 20 nm.

20. A device manufacturing method comprising:

projecting a patterned beam of radiation onto a target portion of a substrate; and

minimizing formation of aberrations in the patterned beam by using a patterning structure having an aluminium absorber layer with a protective top coating.

21. A device manufacturing method according to claim 20, wherein the aluminium forms a substantially flat surface.

22. A device manufacturing method according to claim 20, wherein the aluminium has a thickness which is substantially constant.

23. A device manufacturing method according to claim 20, wherein the aluminium has a thickness of about 50 to about 200 nm.

24. A device manufacturing method according to claim 20, wherein the aluminium has a thickness of about 70 nm.

25. A device manufacturing method according to claim 20, wherein the aluminium has a protective top coating of any of aluminium oxide, aluminium nitride, chromium oxide, ruthenium, niobium or any combination thereof.

26. A device manufacturing method according to claim 20, wherein the protective top coating has a thickness of about 0.1 to about 5 nm.

27. A device manufacturing method according to claim 20, wherein the protective top coating has a thickness of about 1 nm.

28. A device manufacturing method according to claim 20, wherein the patterning structure comprises a material with a low CTE.

29. A device manufacturing method according to claim 20, wherein beneath the aluminium absorber layer there is a series of alternating layers of high index refraction material and low index refraction material.

30. A device manufacturing method according to claim 29, wherein there are about 20 to 80 layers of high and low index refraction material.

31. A device manufacturing method according to claim 29, wherein combinations of high and low index refraction material are as follows: Mo/Si; Ru/Si; Ru-Mo/Si; Rh/Si; Pd/Si; Pt/Si; Mo/Y; Ru-Mo/Y; Ru-Mo/Y; or Mo alloys and Si alloys.

32. A device manufacturing method according to claim 29, wherein the high and low index refraction material have a thickness of about 1 nm to about 10 nm.

33. A device manufacturing method according to claim 29, wherein between the high and low index refraction material there is a barrier layer.

34. A device manufacturing method according to claim 20, wherein the patterning structure further comprises a buffer layer.

35. A device manufacturing method according to claim 34, wherein the buffer layer is silicon dioxide.

36. A device manufacturing method according to claim 20, wherein the beam is projected using reflective or refractive means.

37. A device manufacturing method according to claim 20, wherein the radiation is Extreme Ultra-Violet radiation (EUV).

38. A device manufacturing method according to claim 20, wherein the radiation has a wavelength of between about 5 nm and about 20 nm.

39. A patterning structure comprising:

a layer of material with a low coefficient of thermal expansion (CTE); and

an aluminium coating with a protective top coating;

wherein the aluminium coating is an absorber layer which imparts the pattern to a beam of radiation.

40. A patterning structure according to claim 39, wherein the aluminium comprises a substantially flat absorber surface.

41. A patterning structure according to claim 39, wherein the aluminium has a thickness which is substantially constant.

42. A patterning structure according to claim 39, wherein the aluminium has a thickness of about 50 nm to about 200 nm.

43. A patterning structure according to claim 39, wherein the aluminium has a thickness of about 70 nm.

44. A patterning structure according to claim 39, wherein the aluminium has a protective top coating of any of aluminium oxide, aluminium nitride, chromium oxide, ruthenium, niobium or any combination thereof.

45. A patterning structure according to claim 44, wherein the protective top coating has a thickness of about 0.1 nm to about 5 nm.

46. A patterning structure according to claim 44, wherein the protective top coating has a thickness of about 1 nm.

47. A patterning structure according to claim 39, wherein the patterning structure comprises a bottom substrate material with a low coefficient of thermal expansion (CTE).

48. A patterning structure according to claim 39, wherein beneath the aluminium absorber layer there is a series of alternating layers of high index refraction material and low index refraction material.

49. A patterning structure according to claim 48, wherein there are about 20 to about 80 layers of high and low index refraction material.

50. A patterning structure according to claim 48, wherein combinations of high and low index refraction material are as follows: Mo/Si; Ru/Si; Ru-Mo/Si; Rh/Si; Pd/Si; Pt/Si; Mo/Y; Ru-Mo/Y; or Mo alloys and Si alloys.

51. A patterning structure according to claim 48, wherein the high and low index refraction material have a thickness of about 1 nm to about 10 nm.

52. A patterning structure according to claim 48, wherein between the high and low index refraction material there is a barrier layer.

53. A patterning structure according to claim 39, wherein the patterning structure further comprises a buffer layer.

54. A patterning structure according to claim 53, wherein the buffer layer is silicon dioxide.

55. A method of forming a patterning structure for use in a lithographic apparatus, the method comprising:

providing a layer of material which has a low coefficient of thermal expansion (CTE);

depositing a series of alternating layers of high index refraction material and low index refraction material onto the layer of material with a low coefficient of thermal expansion (CTE);

depositing a buffer layer onto the series of alternating layers of high index refraction material and low index material;

depositing an aluminium absorber layer onto said buffer layer; and

forming a protective coating on top of the aluminium absorber.

56. A method according to claim 55 wherein a radiation-sensitive layer is deposited onto the protective coating and is then etched to form a pattern.

57. A method according to claim 55 wherein the etching process comprises a reactive ion etch process and dry etching processes.

58. Integrated circuits (ICs) made using the lithographic apparatus according to claim 1.

59. Integrated optical systems made using the lithographic apparatus according to claim 1.

60. Guidance and detection patterns for magnetic domain memories made using the lithographic apparatus according to claim 1.

61. Liquid crystal displays (LCDs) made using the lithographic apparatus according to claim 1.

62. Thin-film magnetic heads made using the lithographic apparatus according to claim 1.